

WHAT IS CLAIMED IS:

1. A method for echo processing in a pulse echo level measurement system, said level measurement system having a transducer for transmitting pulses and receiving echoes and including a receiver for converting the received echoes into corresponding received signals, said method comprising the steps of:

- (a) transmitting a transmit pulse to a reflective surface;
- (b) receiving an echo and converting the echo into a receive signal, said receive signal having a plurality of peaks;
- (c) high-pass filtering said receive signal to create a filtered signal;
- (d) creating a correlation signal from the addition of said filtered signal to a copy of said filtered signal shifted by a time unit;
- (e) identifying a correlation indicator of said correlation signal;
- (f) repeating steps (d) and (e) for a range of time units to generate a set of said correlation signals and correlation indicators; and
- (g) selecting an echo time based upon a maximum correlation as determined by one of said correlation indicators, said echo time corresponding to the time shift at which said maximum correlation occurs, and said echo time indicating the echo distance travel time.

2. The method claimed in claim 1, wherein said correlation indicator corresponds to the maximum peak value of said correlation signal.

3. The method claimed in claim 2, wherein said maximum correlation is determined by the highest of said maximum peak values.

4. The method claimed in claim 1, further including a step of sampling said receive signal.

5. The method claimed in claim 4, wherein said range of time units includes a sequence of time units each corresponding to a sample point, and said step (d) is performed using said filtered signal iteratively shifted by said sequence of time units.
7. The method claimed in claim 6. wherein said step of sampling defines a sampling interval and said sample points include a first sample point taken one sampling interval following said step of transmitting.
8. The method claimed in claim 4, wherein said step of sampling includes digitizing said receive signal.
9. The method claimed in claim 1, wherein said step of creating a correlation signal includes adding said filtered signal to a plurality of said filtered signals each shifted by a time shift.
10. A pulse-echo acoustic ranging system comprising:
 - (a) a transducer for emitting acoustic pulses and detecting reflected echoes;
 - (b) a controller having a receiver component and a transmitter component;
 - (c) said transducer having an input port operatively coupled to said transmitter component and being responsive to said transmitter component for emitting said acoustic pulses, and said transducer including an output port operatively coupled to said receiver component for outputting reflected echoes coupled by said transducer;
 - (d) said receiver component converting said reflected acoustic pulses into a receive signal, said receive signal having a plurality of peaks and troughs;
 - (e) said controller including a first program component for creating a plurality of correlation signals by adding said filtered signal to a copy of said filtered signal shifted by a plurality of time units, a second program component for

identifying a correlation indicator of each of said correlation signals, and a third program component for selecting an echo time based upon a maximum correlation as determined by one of said correlation indicators, said echo time being the time shift at which said maximum correlation occurs, and whereby the selected time indicates the echo distance travel time.

11. The system claimed in claim 10, wherein said correlation indicator corresponds to the maximum peak value of said correlation signal.

12. The system claimed in claim 11, wherein said maximum correlation is determined by the highest of said maximum peak values.

13. The system claimed in claim 10, further including a sampling component for sampling said receive signal.

14. The system claimed in claim 13, wherein said plurality of time units includes a sequence of time units each corresponding to a sample point.

15. The system claimed in claim 14, wherein said sampling component defines a sampling interval and said sample points include a first sample point taken one sampling interval following emission of an acoustic pulse.

16. The system claimed in claim 13, wherein said sampling component includes a digitization component for digitizing said receive signal.

17. The system claimed in claim 10, further including a high-pass filter component for filtering said receive signal.